COPY

DRAINAGE REPORT

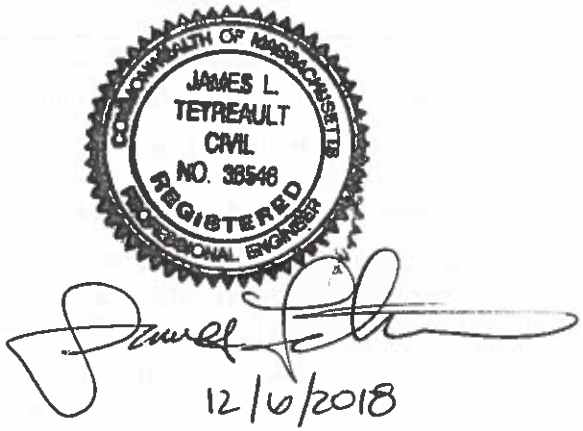
for

THE RIDINGS

EXHIBIT 9

Job #328-813 Client #1002

OCTOBER 9, 2018
REVISED DECEMBER 6, 2018



THOMPSON-LISTON ASSOCIATES, INC. CIVIL ENGINEERS & LAND SURVEYORS
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Drainage Report

for

The Ridings

Proposed flexible plan development of 39 lots at
88 Adams Road, Grafton, Massachusetts

December 6, 2018

Project Description

The project is the development of an 69.77 acre site in Grafton and also a similar size site in Westborough. There are 39 lots proposed in Grafton and another 19 in Westborough. Both developments will be "open space" subdivisions creating large open space parcels on their northerly sides which will be contiguous to existing protected land in Westborough. The site is shown as parcel 10 on assessor's map 32 in Grafton and is bounded westerly by homes along Adams Road, northerly by land of LaFlamme, easterly by the Town Line and southerly by the Massachusetts Turnpike. This report compares predevelopment and postdevelopment stormwater runoff in the Grafton portion of the site.

The applicant proposes to create Stidsen Road, named after a previous holder of the property, which will enter at the site's frontage on Adams Road in Grafton then proceed easterly into Westborough and connect to an extension of Harvest Way in that Town. Two culs de sac, Olive Circle and Randolph Circle, will be created on the northerly side of Stidsen Road in Grafton.

The existing cover of the site in Grafton is completely wooded with some existing trails on site. The soils on site are predominantly Paxton series soils categorized as hydrologic soil group "C" soils. There are also Chatfield Hollis series soils categorized as hydrologic soil group "B" soils at the southeast and westerly boundaries of the site. And there is an area in the southerly portion of the site labeled as "gravel pits" on the MassGIS soil maps. We are categorizing this area as hydrologic soil group "A" soils.

There is an intermittent stream and a wetland that flows from north to south through the site to a culvert at the Massachusetts Turnpike. The more easterly two thirds of the Grafton property slopes down to the west to this wetland. The westerly end of the site also flows down to this property.

Because these lots in Grafton are all to be served by septic systems, we have already had more than 80 deep observation holes officially observed by the Grafton Board of Health and this testing corroborated these characterizations of the soils present in different portions of the site.

Because some more than 6 acres of the site will have impervious cover and another 21 acres of the site will have its existing wooded cover changed to lawn or grass plot, there would be an increase in the peak rate of flow if measures were not taken to mitigate this change. To prevent this, we will create an infiltration basin beside Olive Circle and a detention basin off the end of Randolph Circle. We will create a large infiltration basin on the south side of Stidsen Road in the area labeled on the soil maps as having been gravel pits. Deep observation holes in this location showed soils to be loamy sand texture.

The effect of these two detention basins and the infiltration basin will be to keep the peak postdevelopment rates of flow to the culverts at the Massachusetts Turnpike below the rates of flow in the existing condition.

In addition, we propose to send roof runoff from 19 lots (numbers 1 – 7, 22-28, 31 – 34 and 37) to dry wells but we are <u>not</u> acknowledging that infiltration in these calculations to be conservative.

Methodology

In order to evaluate the existing and proposed hydrologic conditions of the site, we have employed the HydroCAD™ stormwater modeling software, which emulates the United States Department of Agriculture, Soil Conservation Service (SCS) hydrograph method as outlined in Technical Release 20 (1982). We have used the SCS modified soil cover complex method of evaluating cover conditions and underlying soil features in developing runoff curve numbers (RCN), and have determined Times of Concentration (ToC), using the methods described in the SCS's National Engineering Handbook, Section 4, Hydrology (1985). Each watershed with its Area, RCN and ToC, is described as a "Subcatchment" in HydroCAD™.

HydroCAD™ uses the Storage-Indication method for routing flows from "Subcatchment" areas through "Reaches" and "Ponds." Reaches are overland flow paths, pipe segments, or stream segments. Ponds are areas that collect water, such as basins, ponds or swales where outlet devices control outflow. Rainfall was determined from the Cornell University web site for this location and was determined to be 3.23, 4.87, 6.16, 7.36 and 8.79 inches in 24 hours for the 2, 10, 25, 50 and 100 year return frequency storms, respectively.

Design Points

Two design points were studied. One is the flow to the more westerly of the two 60 inch culverts conveying flow under the Massachusetts Turnpike. This is where the great majority of runoff from this site goes. The second design point is the more easterly 60 inch culvert under the Massachusetts Turnpike.

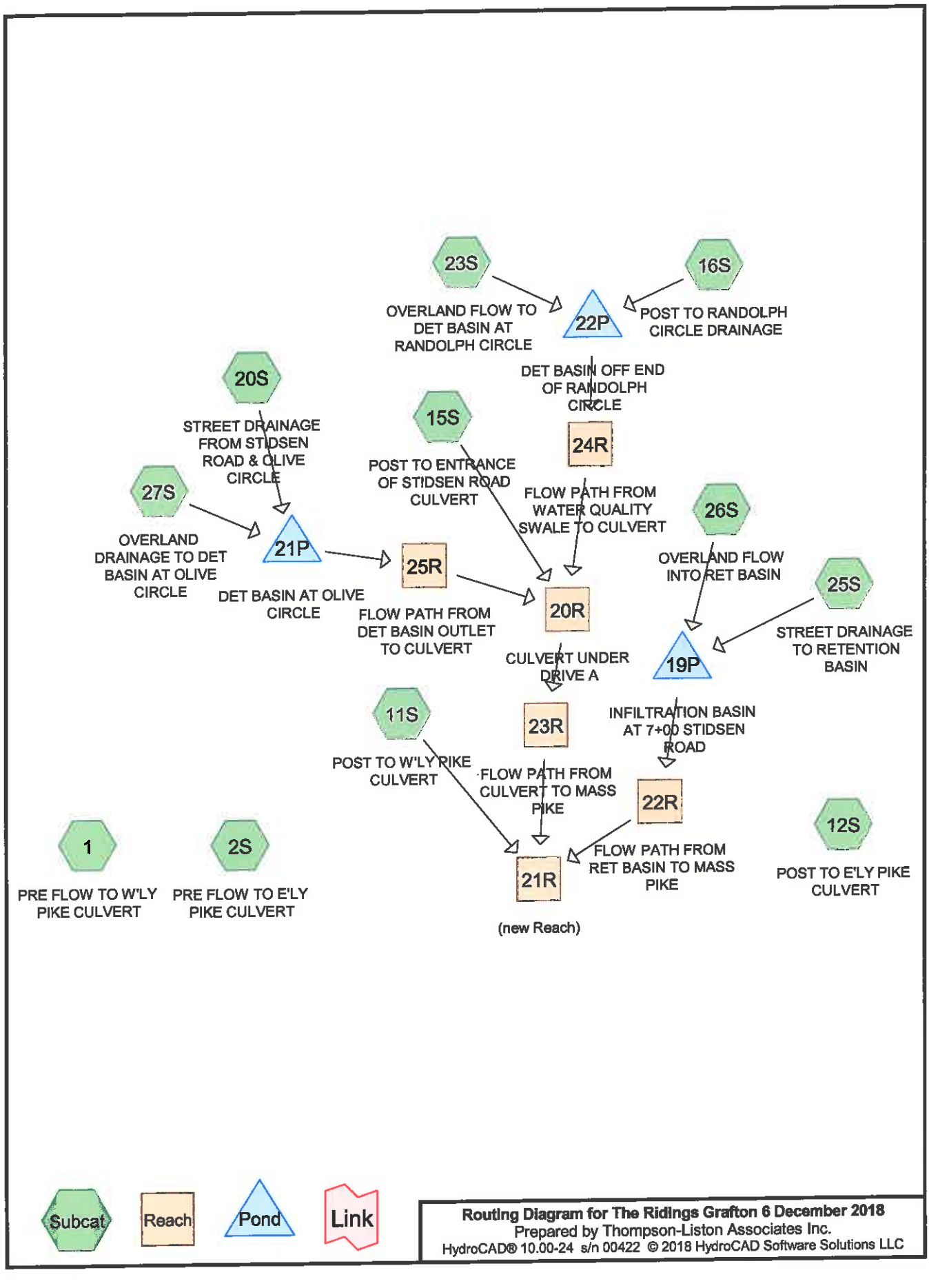
Please note that analogous postdevelopment subcatchment areas have the same number as the predevelopment subcatchment for that area plus 10. Thus, the overland flow to the more westerly culvert under the Massachusetts Turnpike is subcatchment #1 in the predevelopment condition and subcatchment #11 in the postdevelopment condition.

Calculation Summary and Comparison of Flows:

The following table compares pre- and post-development flows at the Design Points (in cfs) :

TABLE A
Peak Rates of Flow of Runoff for Storm Events

Design Point	2-YR	10-YR	25-YR	50-yr	100-YR
W'ly culvert under I-90					
Subcatchment 1 pre	36.99	102.57	163.37	223.94	299.30
Reach 21 post	31.01	87.67	138.13	193.10	282.20
E'ly culvert under I-90					
Subcatchment 2 pre	1.84	5.37	8.67	11.96	16.07
Subcatchment 12 post	1.80	5.26	8.49	11.72	15.74


23S
16S
OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE
22P
POST TO RANDOLPH CIRCLE DRAINAGE
DET BASIN OFF END OF RANDOLPH CIRCLE
20S
15S
24R
STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE
POST TO ENTRANCE OF STIDSEN ROAD CULVERT
27S
FLOW PATH FROM WATER QUALITY SWALE TO CULVERT
26S
OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE
21P
25R
OVERLAND FLOW INTO RET BASIN
25S
DET BASIN AT OLIVE CIRCLE
FLOW PATH FROM DET BASIN OUTLET TO CULVERT
20R
STREET DRAINAGE TO RETENTION BASIN
CULVERT UNDER DRIVE A
19P
11S
23R
INFILTRATION BASIN AT 7+00 STIDSEN ROAD
POST TO W'LY PIKE CULVERT
FLOW PATH FROM CULVERT TO MASS PIKE
22R
12S
1
2S
FLOW PATH FROM RET BASIN TO MASS PIKE
21R
PRE FLOW TO W'LY PIKE CULVERT
PRE FLOW TO E'LY PIKE CULVERT
POST TO E'LY PIKE CULVERT
(new Reach)
Subcat
Reach
Pond
Link
Routing Diagram for The Ridings Grafton 6 December 2018
Prepared by Thompson-Liston Associates Inc.
HydroCAD® 10.00-24 s/n 00422 © 2018 HydroCAD Software Solutions LLC

2 YEAR STORM

Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff = 36.99 cfs @ 12.43 hrs, Volume= 5.132 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

Area (sf)	CN	Description
252,232	30	Woods, Good, HSG A
130,414	55	Woods, Good, HSG B
3,464,785	70	Woods, Good, HSG C
3,847,431	67	Weighted Average
3,847,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.3	2,115	0.0310	5.58	111.63	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
25.8	3,242	Total			

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff = 1.84 cfs @ 12.22 hrs, Volume= 0.206 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
124,226	70	Woods, Good, HSG C
164,112	66	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff = 0.84 cfs @ 12.44 hrs, Volume= 0.179 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

	Area (sf)	CN	Description
*	1,260	98	Impervious A soils
*	1,260	98	Impervious B soils
*	12,600	98	Impervious C soils
	108,430	30	Woods, Good, HSG A
	5,012	55	Woods, Good, HSG B
	70,431	70	Woods, Good, HSG C
	57,257	39	>75% Grass cover, Good, HSG A
	6,593	61	>75% Grass cover, Good, HSG B
	99,683	74	>75% Grass cover, Good, HSG C
	362,526	55	Weighted Average
	347,406		95.83% Pervious Area
	15,120		4.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.9	992	0.0800	4.24		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
13.4	1,042	Total			

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff = 1.80 cfs @ 12.22 hrs, Volume= 0.202 af, Depth> 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
111,978	70	Woods, Good, HSG C
8,865	74	>75% Grass cover, Good, HSG C
160,729	66	Weighted Average
160,729		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

Runoff = 26.62 cfs @ 12.38 hrs, Volume= 3.392 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

Area (sf)	CN	Description
25,208	98	Paved parking & roofs
15,609	30	Woods, Good, HSG A
57,023	55	Woods, Good, HSG B
1,826,893	70	Woods, Good, HSG C
1,620	39	>75% Grass cover, Good, HSG A
7,767	61	>75% Grass cover, Good, HSG B
177,108	74	>75% Grass cover, Good, HSG C
2,111,228	70	Weighted Average
2,086,020		98.81% Pervious Area
25,208		1.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.8	1,638	0.0320	5.67	113.41	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
24.3	2,765	Total			

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

Runoff = 7.23 cfs @ 12.36 hrs, Volume= 0.852 af, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

Area (sf)	CN	Description
66,896	98	Paved parking & roofs
66,352	70	Woods, Good, HSG C
212,436	74	>75% Grass cover, Good, HSG C
345,684	78	Weighted Average
278,788		80.65% Pervious Area
66,896		19.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.1	1,313	0.0970	1.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	1,363	Total			

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

Runoff = 2.85 cfs @ 12.17 hrs, Volume= 0.248 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

	Area (sf)	CN	Description
*	10,247	98	Impervious B soils
*	24,274	98	Impervious C soils
	6,013	70	Woods, Good, HSG C
	6,329	61	>75% Grass cover, Good, HSG B
	32,602	74	>75% Grass cover, Good, HSG C
	79,465	83	Weighted Average
	44,944		56.56% Pervious Area
	34,521		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0100	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
1.0	122	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	172	Total			

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

Runoff = 6.75 cfs @ 12.33 hrs, Volume= 0.810 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

Area (sf)	CN	Description
2,512	98	Paved parking & roofs
19,818	74	>75% Grass cover, Good, HSG C
481,569	70	Woods, Good, HSG C
503,899	70	Weighted Average
501,387		99.50% Pervious Area
2,512		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.1	1,085	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.8	1,135	Total			

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

Runoff = 11.43 cfs @ 12.18 hrs, Volume= 1.029 af, Depth> 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

	Area (sf)	CN	Description
*	14,440	98	Impervious in A soils
*	2,086	98	Impervious in B soils
*	107,932	98	Impervious in C soils
	19,587	70	Woods, Good, HSG C
	17,729	39	>75% Grass cover, Good, HSG A
	14,430	61	>75% Grass cover, Good, HSG B
	220,338	74	>75% Grass cover, Good, HSG C
	396,542	79	Weighted Average
	272,084		68.61% Pervious Area
	124,458		31.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
4.6	438	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	158	0.0440	4.26		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.4	646	Total			

Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

Runoff = 0.00 cfs @ 23.95 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

Area (sf)	CN	Description
36,895	39	>75% Grass cover, Good, HSG A
36,895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	43	0.1860	0.24		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	26	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
3.1	69	Total			

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.020 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YEAR Rainfall=3.23"

	Area (sf)	CN	Description
*	2,085	98	Impervious - wet bottom
	1,108	74	>75% Grass cover, Good, HSG C
	11,382	61	>75% Grass cover, Good, HSG B
	14,575	67	Weighted Average
	12,490		85.69% Pervious Area
	2,085		14.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0800	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	24	0.0330	2.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.9	74	Total			

Summary for Reach 20R: CULVERT UNDER DRIVE A

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 0.88" for 2 YEAR event
Inflow = 30.37 cfs @ 12.41 hrs, Volume= 5.132 af
Outflow = 30.35 cfs @ 12.42 hrs, Volume= 5.131 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.66 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.72 fps, Avg. Travel Time= 0.3 min

Peak Storage= 246 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished
Length= 54.0' Slope= 0.0093 '/'
Inlet Invert= 429.00', Outlet Invert= 428.50'

Summary for Reach 21R: (new Reach)

Inflow Area = 88.403 ac, 7.03% Impervious, Inflow Depth > 0.72" for 2 YEAR event
Inflow = 31.01 cfs @ 12.46 hrs, Volume= 5.310 af
Outflow = 31.01 cfs @ 12.46 hrs, Volume= 5.310 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

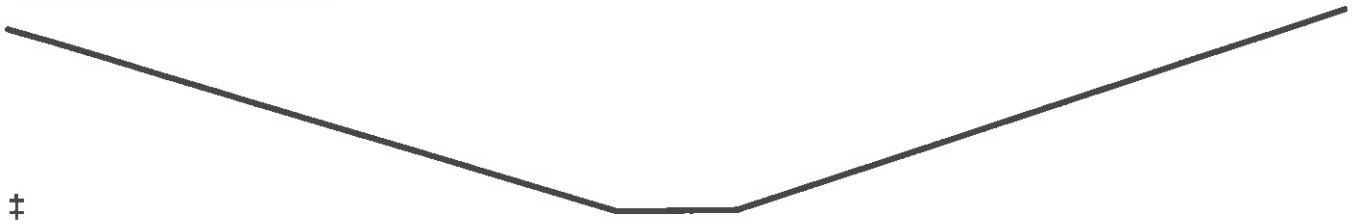
Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth = 0.01" for 2 YEAR event
Inflow = 0.05 cfs @ 14.56 hrs, Volume= 0.009 af
Outflow = 0.05 cfs @ 14.59 hrs, Volume= 0.009 af, Atten= 0%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.94 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 1.2 min

Peak Storage= 3 cf @ 14.57 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 60.0' Slope= 0.0750 '/'
Inlet Invert= 420.50', Outlet Invert= 416.00'



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Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 0.88" for 2 YEAR event
Inflow = 30.35 cfs @ 12.42 hrs, Volume= 5.131 af
Outflow = 30.17 cfs @ 12.46 hrs, Volume= 5.122 af, Atten= 1%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.77 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 2.48 fps, Avg. Travel Time= 2.8 min

Peak Storage= 2,680 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.94'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 423.0' Slope= 0.0284 '/'
Inlet Invert= 428.50', Outlet Invert= 416.50'

‡

Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 1.02" for 2 YEAR event
Inflow = 9.67 cfs @ 12.61 hrs, Volume= 1.657 af
Outflow = 9.24 cfs @ 12.80 hrs, Volume= 1.644 af, Atten= 4%, Lag= 11.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 6.2 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 13.5 min

Peak Storage= 3,459 cf @ 12.70 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 1,309.0' Slope= 0.0252 '/'
Inlet Invert= 462.00', Outlet Invert= 429.00'

‡

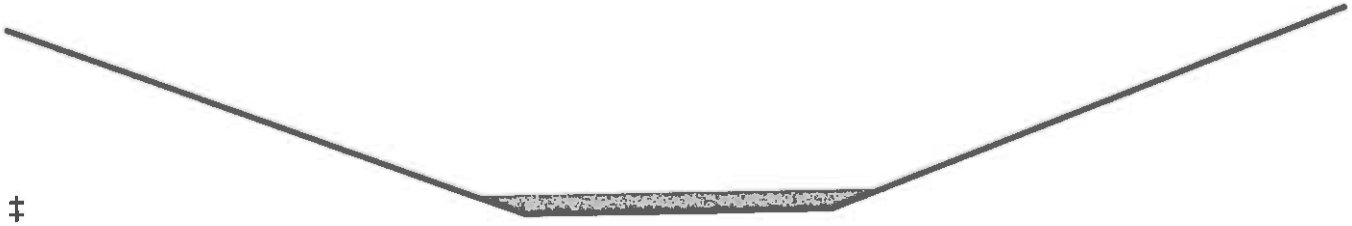
Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth = 0.54" for 2 YEAR event
Inflow = 0.66 cfs @ 12.62 hrs, Volume= 0.096 af
Outflow = 0.65 cfs @ 12.67 hrs, Volume= 0.096 af, Atten= 0%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.95 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 3.1 min

Peak Storage= 65 cf @ 12.64 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 95.0' Slope= 0.0132 '/'
Inlet Invert= 430.25', Outlet Invert= 429.00'



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Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 1.24" for 2 YEAR event
Inflow = 11.43 cfs @ 12.18 hrs, Volume= 1.029 af
Outflow = 0.92 cfs @ 14.56 hrs, Volume= 0.798 af, Atten= 92%, Lag= 142.7 min
Discarded = 0.88 cfs @ 14.56 hrs, Volume= 0.789 af
Primary = 0.05 cfs @ 14.56 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 426.11' @ 14.56 hrs Surf.Area= 15,686 sf Storage= 23,112 cf

Plug-Flow detention time= 285.6 min calculated for 0.796 af (77% of inflow)
Center-of-Mass det. time= 201.4 min (1,051.3 - 849.9)

Volume	Invert	Avail.Storage	Storage Description
#1	423.00'	111,220 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.00	0	0	0
424.00	3,900	1,950	1,950
426.00	15,500	19,400	21,350
428.00	18,800	34,300	55,650
430.00	22,400	41,200	96,850
430.60	25,500	14,370	111,220

Device	Routing	Invert	Outlet Devices
#1	Discarded	423.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	426.00'	**8.0" Round Culvert** L= 53.0' Ke= 0.500 Inlet / Outlet Invert= 426.00' / 422.00' S= 0.0755 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Primary	429.00'	**18.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.88 cfs @ 14.56 hrs HW=426.11' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.04 cfs @ 14.56 hrs HW=426.11' (Free Discharge)
├**2=Culvert** (Inlet Controls 0.04 cfs @ 1.14 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth > 1.49" for 2 YEAR event
Inflow = 3.02 cfs @ 12.17 hrs, Volume= 0.267 af
Outflow = 0.84 cfs @ 12.62 hrs, Volume= 0.248 af, Atten= 72%, Lag= 27.2 min
Discarded = 0.18 cfs @ 12.62 hrs, Volume= 0.152 af
Primary = 0.66 cfs @ 12.62 hrs, Volume= 0.096 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 433.23' @ 12.62 hrs Surf.Area= 3,297 sf Storage= 4,362 cf

Plug-Flow detention time= 140.9 min calculated for 0.248 af (93% of inflow)
Center-of-Mass det. time= 103.6 min (943.8 - 840.2)

Volume	Invert	Avail.Storage	Storage Description
#1	431.00'	34,416 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
438.20	10,500	1,921	34,416

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	431.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 12.62 hrs HW=433.23' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.66 cfs @ 12.62 hrs HW=433.23' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.66 cfs @ 3.34 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 1.02" for 2 YEAR event
Inflow = 13.94 cfs @ 12.35 hrs, Volume= 1.662 af
Outflow = 9.67 cfs @ 12.61 hrs, Volume= 1.657 af, Atten= 31%, Lag= 15.9 min
Primary = 9.67 cfs @ 12.61 hrs, Volume= 1.657 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 481.57' @ 12.61 hrs Surf.Area= 7,757 sf Storage= 13,037 cf

Plug-Flow detention time= 20.1 min calculated for 1.653 af (99% of inflow)
Center-of-Mass det. time= 18.2 min (892.0 - 873.8)

Volume	Invert	Avail.Storage	Storage Description
#1	479.00'	54,040 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
479.00	0	0	0
480.00	5,400	2,700	2,700
482.00	8,400	13,800	16,500
484.00	11,500	19,900	36,400
485.40	13,700	17,640	54,040

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	483.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'	**15.0" Vert. Orifice/Grate X 3.00** C= 0.600

Primary OutFlow Max=9.63 cfs @ 12.61 hrs HW=481.57' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 5.44 cfs @ 6.93 fps)
- **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **3=Orifice/Grate** (Orifice Controls 4.19 cfs @ 2.57 fps)

10 YEAR STORM

Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff = 102.57 cfs @ 12.39 hrs, Volume= 12.528 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

Area (sf)	CN	Description
252,232	30	Woods, Good, HSG A
130,414	55	Woods, Good, HSG B
3,464,785	70	Woods, Good, HSG C
3,847,431	67	Weighted Average
3,847,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.3	2,115	0.0310	5.58	111.63	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
25.8	3,242	Total			

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff = 5.37 cfs @ 12.20 hrs, Volume= 0.513 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
124,226	70	Woods, Good, HSG C
164,112	66	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff = 5.38 cfs @ 12.23 hrs, Volume= 0.633 af, Depth> 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

	Area (sf)	CN	Description
*	1,260	98	Impervious A soils
*	1,260	98	Impervious B soils
*	12,600	98	Impervious C soils
	108,430	30	Woods, Good, HSG A
	5,012	55	Woods, Good, HSG B
	70,431	70	Woods, Good, HSG C
	57,257	39	>75% Grass cover, Good, HSG A
	6,593	61	>75% Grass cover, Good, HSG B
	99,683	74	>75% Grass cover, Good, HSG C
	362,526	55	Weighted Average
	347,406		95.83% Pervious Area
	15,120		4.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.9	992	0.0800	4.24		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
13.4	1,042	Total			

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff = 5.26 cfs @ 12.20 hrs, Volume= 0.503 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
111,978	70	Woods, Good, HSG C
8,865	74	>75% Grass cover, Good, HSG C
160,729	66	Weighted Average
160,729		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

Runoff = 66.68 cfs @ 12.36 hrs, Volume= 7.793 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

Area (sf)	CN	Description
25,208	98	Paved parking & roofs
15,609	30	Woods, Good, HSG A
57,023	55	Woods, Good, HSG B
1,826,893	70	Woods, Good, HSG C
1,620	39	>75% Grass cover, Good, HSG A
7,767	61	>75% Grass cover, Good, HSG B
177,108	74	>75% Grass cover, Good, HSG C
2,111,228	70	Weighted Average
2,086,020		98.81% Pervious Area
25,208		1.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.8	1,638	0.0320	5.67	113.41	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
24.3	2,765	Total			

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

Runoff = 14.85 cfs @ 12.35 hrs, Volume= 1.712 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

Area (sf)	CN	Description
66,896	98	Paved parking & roofs
66,352	70	Woods, Good, HSG C
212,436	74	>75% Grass cover, Good, HSG C
345,684	78	Weighted Average
278,788		80.65% Pervious Area
66,896		19.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.1	1,313	0.0970	1.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	1,363	Total			

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

Runoff = 5.32 cfs @ 12.17 hrs, Volume= 0.464 af, Depth> 3.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

	Area (sf)	CN	Description
*	10,247	98	Impervious B soils
*	24,274	98	Impervious C soils
	6,013	70	Woods, Good, HSG C
	6,329	61	>75% Grass cover, Good, HSG B
	32,602	74	>75% Grass cover, Good, HSG C
	79,465	83	Weighted Average
	44,944		56.56% Pervious Area
	34,521		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0100	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
1.0	122	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	172	Total			

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

Runoff = 16.97 cfs @ 12.30 hrs, Volume= 1.862 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

Area (sf)	CN	Description
2,512	98	Paved parking & roofs
19,818	74	>75% Grass cover, Good, HSG C
481,569	70	Woods, Good, HSG C
503,899	70	Weighted Average
501,387		99.50% Pervious Area
2,512		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.1	1,085	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.8	1,135	Total			

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

Runoff = 23.17 cfs @ 12.17 hrs, Volume= 2.036 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

	Area (sf)	CN	Description
*	14,440	98	Impervious in A soils
*	2,086	98	Impervious in B soils
*	107,932	98	Impervious in C soils
	19,587	70	Woods, Good, HSG C
	17,729	39	>75% Grass cover, Good, HSG A
	14,430	61	>75% Grass cover, Good, HSG B
	220,338	74	>75% Grass cover, Good, HSG C
	396,542	79	Weighted Average
	272,084		68.61% Pervious Area
	124,458		31.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
4.6	438	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	158	0.0440	4.26		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.4	646	Total			

Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

Runoff = 0.02 cfs @ 12.46 hrs, Volume= 0.012 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

Area (sf)	CN	Description
36,895	39	>75% Grass cover, Good, HSG A
36,895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	43	0.1860	0.24		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	26	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
3.1	69	Total			

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

Runoff = 0.65 cfs @ 12.08 hrs, Volume= 0.048 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=4.87"

	Area (sf)	CN	Description
*	2,085	98	Impervious - wet bottom
	1,108	74	>75% Grass cover, Good, HSG C
	11,382	61	>75% Grass cover, Good, HSG B
	14,575	67	Weighted Average
	12,490		85.69% Pervious Area
	2,085		14.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0800	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	24	0.0330	2.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.9	74	Total			

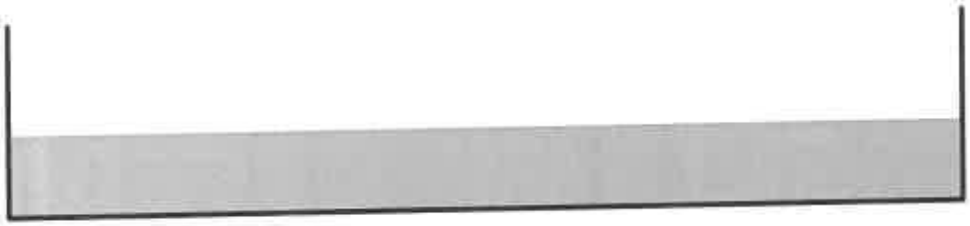
Summary for Reach 20R: CULVERT UNDER DRIVE A

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 1.99" for 10 YEAR event
Inflow = 82.81 cfs @ 12.43 hrs, Volume= 11.623 af
Outflow = 82.78 cfs @ 12.43 hrs, Volume= 11.622 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.66 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.43 fps, Avg. Travel Time= 0.3 min

Peak Storage= 462 cf @ 12.43 hrs
Average Depth at Peak Storage= 0.86'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished
Length= 54.0' Slope= 0.0093 '/'
Inlet Invert= 429.00', Outlet Invert= 428.50'



Summary for Reach 21R: (new Reach)

Inflow Area =	88.403 ac,	7.03% Impervious,	Inflow Depth >	1.75" for 10 YEAR event
Inflow =	87.67 cfs @	12.46 hrs, Volume=	12.924 af	
Outflow =	87.67 cfs @	12.46 hrs, Volume=	12.924 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

Inflow Area =	9.950 ac,	28.71% Impervious,	Inflow Depth =	0.82" for 10 YEAR event
Inflow =	1.70 cfs @	13.19 hrs, Volume=	0.683 af	
Outflow =	1.70 cfs @	13.20 hrs, Volume=	0.683 af,	Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.13 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.28 fps, Avg. Travel Time= 0.4 min

Peak Storage= 33 cf @ 13.19 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 60.0' Slope= 0.0750 '/'
Inlet Invert= 420.50', Outlet Invert= 416.00'

‡

Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 1.99" for 10 YEAR event
Inflow = 82.78 cfs @ 12.43 hrs, Volume= 11.622 af
Outflow = 82.44 cfs @ 12.47 hrs, Volume= 11.609 af, Atten= 0%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.16 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.91 fps, Avg. Travel Time= 2.4 min

Peak Storage= 5,681 cf @ 12.45 hrs
Average Depth at Peak Storage= 1.45'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 423.0' Slope= 0.0284 '/'
Inlet Invert= 428.50', Outlet Invert= 416.50'

‡

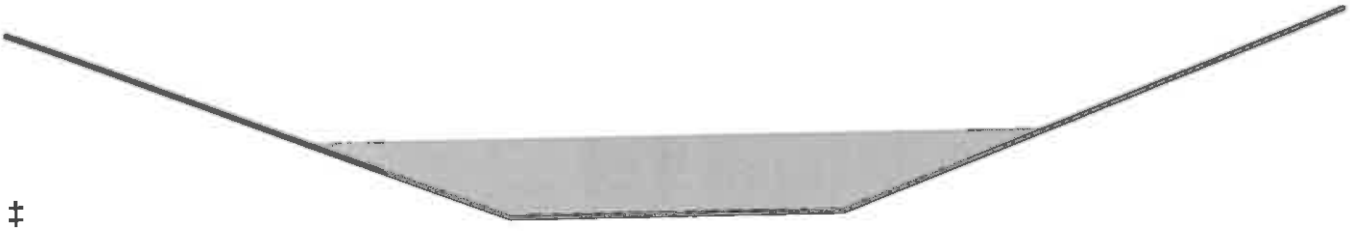
Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 2.19" for 10 YEAR event
Inflow = 25.08 cfs @ 12.51 hrs, Volume= 3.563 af
Outflow = 24.68 cfs @ 12.65 hrs, Volume= 3.544 af, Atten= 2%, Lag= 8.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.67 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 1.96 fps, Avg. Travel Time= 11.2 min

Peak Storage= 6,935 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 1,309.0' Slope= 0.0252 '/'
Inlet Invert= 462.00', Outlet Invert= 429.00'



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Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth = 1.59" for 10 YEAR event
Inflow = 1.20 cfs @ 12.63 hrs, Volume= 0.286 af
Outflow = 1.20 cfs @ 12.67 hrs, Volume= 0.286 af, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.17 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 2.5 min

Peak Storage= 98 cf @ 12.64 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 95.0' Slope= 0.0132 '/'
Inlet Invert= 430.25', Outlet Invert= 429.00'

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Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 2.47" for 10 YEAR event
Inflow = 23.17 cfs @ 12.17 hrs, Volume= 2.048 af
Outflow = 2.69 cfs @ 13.19 hrs, Volume= 1.642 af, Atten= 88%, Lag= 60.8 min
Discarded = 0.99 cfs @ 13.19 hrs, Volume= 0.960 af
Primary = 1.70 cfs @ 13.19 hrs, Volume= 0.683 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 427.36' @ 13.19 hrs Surf.Area= 17,740 sf Storage= 43,908 cf

Plug-Flow detention time= 231.0 min calculated for 1.639 af (80% of inflow)
Center-of-Mass det. time= 154.8 min (986.1 - 831.3)

Volume	Invert	Avail.Storage	Storage Description
#1	423.00'	111,220 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.00	0	0	0
424.00	3,900	1,950	1,950
426.00	15,500	19,400	21,350
428.00	18,800	34,300	55,650
430.00	22,400	41,200	96,850
430.60	25,500	14,370	111,220

Device	Routing	Invert	Outlet Devices
#1	Discarded	423.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	426.00'	**8.0" Round Culvert** L= 53.0' Ke= 0.500 Inlet / Outlet Invert= 426.00' / 422.00' S= 0.0755 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Primary	429.00'	**18.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.99 cfs @ 13.19 hrs HW=427.36' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.99 cfs)

Primary OutFlow Max=1.70 cfs @ 13.19 hrs HW=427.36' (Free Discharge)
├**2=Culvert** (Inlet Controls 1.70 cfs @ 4.87 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth > 2.84" for 10 YEAR event
Inflow = 5.79 cfs @ 12.16 hrs, Volume= 0.511 af
Outflow = 1.45 cfs @ 12.63 hrs, Volume= 0.472 af, Atten= 75%, Lag= 28.0 min
Discarded = 0.25 cfs @ 12.63 hrs, Volume= 0.187 af
Primary = 1.20 cfs @ 12.63 hrs, Volume= 0.286 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 434.37' @ 12.63 hrs Surf.Area= 4,461 sf Storage= 8,757 cf

Plug-Flow detention time= 113.1 min calculated for 0.471 af (92% of inflow)
Center-of-Mass det. time= 74.4 min (896.7 - 822.3)

Volume	Invert	Avail.Storage	Storage Description
#1	431.00'	34,416 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
438.20	10,500	1,921	34,416

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	431.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.25 cfs @ 12.63 hrs HW=434.37' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=1.20 cfs @ 12.63 hrs HW=434.37' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 1.20 cfs @ 6.13 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 2.20" for 10 YEAR event
Inflow = 31.67 cfs @ 12.32 hrs, Volume= 3.574 af
Outflow = 25.08 cfs @ 12.51 hrs, Volume= 3.563 af, Atten= 21%, Lag= 11.2 min
Primary = 25.08 cfs @ 12.51 hrs, Volume= 3.563 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 482.69' @ 12.51 hrs Surf.Area= 9,475 sf Storage= 22,700 cf

Plug-Flow detention time= 18.8 min calculated for 3.563 af (100% of inflow)
Center-of-Mass det. time= 17.0 min (868.7 - 851.7)

Volume	Invert	Avail.Storage	Storage Description
#1	479.00'	54,040 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
479.00	0	0	0
480.00	5,400	2,700	2,700
482.00	8,400	13,800	16,500
484.00	11,500	19,900	36,400
485.40	13,700	17,640	54,040

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	483.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'	**15.0" Vert. Orifice/Grate X 3.00** C= 0.600

Primary OutFlow Max=25.05 cfs @ 12.51 hrs HW=482.69' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 6.75 cfs @ 8.60 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**3=Orifice/Grate** (Orifice Controls 18.30 cfs @ 4.97 fps)

25 YEAR STORM

Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff = 163.37 cfs @ 12.37 hrs, Volume= 19.402 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

Area (sf)	CN	Description
252,232	30	Woods, Good, HSG A
130,414	55	Woods, Good, HSG B
3,464,785	70	Woods, Good, HSG C
3,847,431	67	Weighted Average
3,847,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.3	2,115	0.0310	5.58	111.63	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
25.8	3,242	Total			

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff = 8.67 cfs @ 12.20 hrs, Volume= 0.801 af, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
124,226	70	Woods, Good, HSG C
164,112	66	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff = 10.97 cfs @ 12.21 hrs, Volume= 1.113 af, Depth> 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

	Area (sf)	CN	Description
*	1,260	98	Impervious A soils
*	1,260	98	Impervious B soils
*	12,600	98	Impervious C soils
	108,430	30	Woods, Good, HSG A
	5,012	55	Woods, Good, HSG B
	70,431	70	Woods, Good, HSG C
	57,257	39	>75% Grass cover, Good, HSG A
	6,593	61	>75% Grass cover, Good, HSG B
	99,683	74	>75% Grass cover, Good, HSG C
	362,526	55	Weighted Average
	347,406		95.83% Pervious Area
	15,120		4.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.9	992	0.0800	4.24		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
13.4	1,042	Total			

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff = 8.49 cfs @ 12.20 hrs, Volume= 0.785 af, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
111,978	70	Woods, Good, HSG C
8,865	74	>75% Grass cover, Good, HSG C
160,729	66	Weighted Average
160,729		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

Runoff = 102.57 cfs @ 12.35 hrs, Volume= 11.784 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

Area (sf)	CN	Description
25,208	98	Paved parking & roofs
15,609	30	Woods, Good, HSG A
57,023	55	Woods, Good, HSG B
1,826,893	70	Woods, Good, HSG C
1,620	39	>75% Grass cover, Good, HSG A
7,767	61	>75% Grass cover, Good, HSG B
177,108	74	>75% Grass cover, Good, HSG C
2,111,228	70	Weighted Average
2,086,020		98.81% Pervious Area
25,208		1.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.8	1,638	0.0320	5.67	113.41	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
24.3	2,765	Total			

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

Runoff = 21.24 cfs @ 12.34 hrs, Volume= 2.449 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

Area (sf)	CN	Description
66,896	98	Paved parking & roofs
66,352	70	Woods, Good, HSG C
212,436	74	>75% Grass cover, Good, HSG C
345,684	78	Weighted Average
278,788		80.65% Pervious Area
66,896		19.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.1	1,313	0.0970	1.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	1,363	Total			

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

Runoff = 7.33 cfs @ 12.16 hrs, Volume= 0.643 af, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

	Area (sf)	CN	Description
*	10,247	98	Impervious B soils
*	24,274	98	Impervious C soils
	6,013	70	Woods, Good, HSG C
	6,329	61	>75% Grass cover, Good, HSG B
	32,602	74	>75% Grass cover, Good, HSG C
	79,465	83	Weighted Average
	44,944		56.56% Pervious Area
	34,521		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0100	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
1.0	122	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	172	Total			

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

Runoff = 26.12 cfs @ 12.30 hrs, Volume= 2.815 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

Area (sf)	CN	Description
2,512	98	Paved parking & roofs
19,818	74	>75% Grass cover, Good, HSG C
481,569	70	Woods, Good, HSG C
503,899	70	Weighted Average
501,387		99.50% Pervious Area
2,512		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.1	1,085	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.8	1,135	Total			

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

Runoff = 32.87 cfs @ 12.17 hrs, Volume= 2.894 af, Depth> 3.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

	Area (sf)	CN	Description
*	14,440	98	Impervious in A soils
*	2,086	98	Impervious in B soils
*	107,932	98	Impervious in C soils
	19,587	70	Woods, Good, HSG C
	17,729	39	>75% Grass cover, Good, HSG A
	14,430	61	>75% Grass cover, Good, HSG B
	220,338	74	>75% Grass cover, Good, HSG C
	396,542	79	Weighted Average
	272,084		68.61% Pervious Area
	124,458		31.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
4.6	438	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	158	0.0440	4.26		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.4	646	Total			

Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

Runoff = 0.18 cfs @ 12.28 hrs, Volume= 0.035 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

Area (sf)	CN	Description
36,895	39	>75% Grass cover, Good, HSG A
36,895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	43	0.1860	0.24		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	26	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
3.1	69	Total			

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

Runoff = 1.03 cfs @ 12.08 hrs, Volume= 0.074 af, Depth> 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YEAR Rainfall=6.16"

	Area (sf)	CN	Description
*	2,085	98	Impervious - wet bottom
	1,108	74	>75% Grass cover, Good, HSG C
	11,382	61	>75% Grass cover, Good, HSG B
	14,575	67	Weighted Average
	12,490		85.69% Pervious Area
	2,085		14.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0800	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	24	0.0330	2.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.9	74	Total			

Summary for Reach 20R: CULVERT UNDER DRIVE A

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 2.99" for 25 YEAR event
Inflow = 129.19 cfs @ 12.41 hrs, Volume= 17.463 af
Outflow = 129.16 cfs @ 12.41 hrs, Volume= 17.461 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.33 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.86 fps, Avg. Travel Time= 0.2 min

Peak Storage= 615 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.14'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished
Length= 54.0' Slope= 0.0093 '/'
Inlet Invert= 429.00', Outlet Invert= 428.50'

Summary for Reach 21R: (new Reach)

Inflow Area = 88.403 ac, 7.03% Impervious, Inflow Depth > 2.70" for 25 YEAR event
Inflow = 138.13 cfs @ 12.43 hrs, Volume= 19.908 af
Outflow = 138.13 cfs @ 12.43 hrs, Volume= 19.908 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 1.63" for 25 YEAR event
Inflow = 2.47 cfs @ 13.24 hrs, Volume= 1.350 af
Outflow = 2.47 cfs @ 13.25 hrs, Volume= 1.350 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.49 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.67 fps, Avg. Travel Time= 0.4 min

Peak Storage= 42 cf @ 13.24 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 60.0' Slope= 0.0750 '/'
Inlet Invert= 420.50', Outlet Invert= 416.00'

‡

Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 2.99" for 25 YEAR event
Inflow = 129.16 cfs @ 12.41 hrs, Volume= 17.461 af
Outflow = 128.75 cfs @ 12.45 hrs, Volume= 17.446 af, Atten= 0%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.89 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 3.15 fps, Avg. Travel Time= 2.2 min

Peak Storage= 7,927 cf @ 12.42 hrs
Average Depth at Peak Storage= 1.75'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 423.0' Slope= 0.0284 '/'
Inlet Invert= 428.50', Outlet Invert= 416.50'

‡

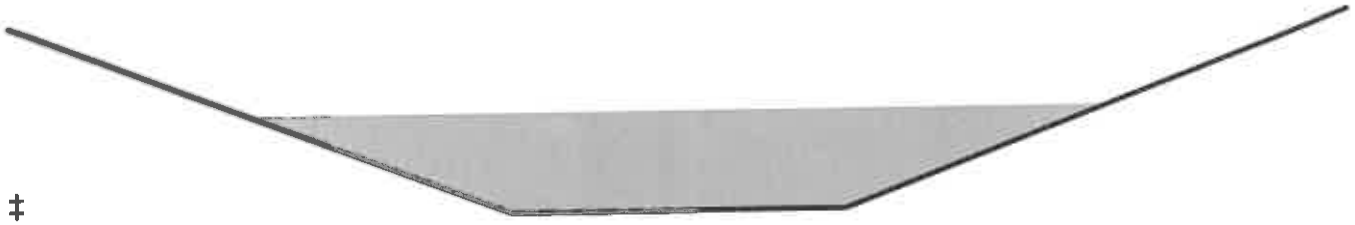
Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 3.23" for 25 YEAR event
Inflow = 41.00 cfs @ 12.45 hrs, Volume= 5.249 af
Outflow = 39.57 cfs @ 12.58 hrs, Volume= 5.226 af, Atten= 3%, Lag= 7.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.33 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 10.2 min

Peak Storage= 9,783 cf @ 12.51 hrs
Average Depth at Peak Storage= 1.05'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 1,309.0' Slope= 0.0252 '/'
Inlet Invert= 462.00', Outlet Invert= 429.00'



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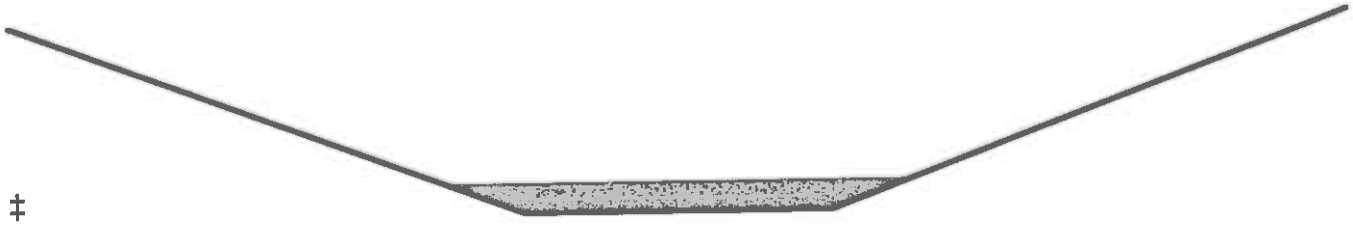
Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth = 2.52" for 25 YEAR event
Inflow = 1.48 cfs @ 12.66 hrs, Volume= 0.453 af
Outflow = 1.48 cfs @ 12.70 hrs, Volume= 0.453 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.25 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 2.4 min

Peak Storage= 113 cf @ 12.67 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 95.0' Slope= 0.0132 '/'
Inlet Invert= 430.25', Outlet Invert= 429.00'



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Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 3.53" for 25 YEAR event
Inflow = 33.03 cfs @ 12.17 hrs, Volume= 2.929 af
Outflow = 3.56 cfs @ 13.24 hrs, Volume= 2.421 af, Atten= 89%, Lag= 64.2 min
Discarded = 1.10 cfs @ 13.24 hrs, Volume= 1.071 af
Primary = 2.47 cfs @ 13.24 hrs, Volume= 1.350 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 428.49' @ 13.24 hrs Surf.Area= 19,673 sf Storage= 64,984 cf

Plug-Flow detention time= 236.9 min calculated for 2.421 af (83% of inflow)
Center-of-Mass det. time= 166.7 min (988.5 - 821.8)

Volume	Invert	Avail.Storage	Storage Description
#1	423.00'	111,220 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.00	0	0	0
424.00	3,900	1,950	1,950
426.00	15,500	19,400	21,350
428.00	18,800	34,300	55,650
430.00	22,400	41,200	96,850
430.60	25,500	14,370	111,220

Device	Routing	Invert	Outlet Devices
#1	Discarded	423.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	426.00'	**8.0" Round Culvert** L= 53.0' Ke= 0.500 Inlet / Outlet Invert= 426.00' / 422.00' S= 0.0755 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Primary	429.00'	**18.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.10 cfs @ 13.24 hrs HW=428.49' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.10 cfs)

Primary OutFlow Max=2.47 cfs @ 13.24 hrs HW=428.49' (Free Discharge)
├**2=Culvert** (Inlet Controls 2.47 cfs @ 7.06 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth > 3.99" for 25 YEAR event
Inflow = 8.05 cfs @ 12.16 hrs, Volume= 0.717 af
Outflow = 1.78 cfs @ 12.66 hrs, Volume= 0.669 af, Atten= 78%, Lag= 30.0 min
Discarded = 0.30 cfs @ 12.66 hrs, Volume= 0.216 af
Primary = 1.48 cfs @ 12.66 hrs, Volume= 0.453 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 435.19' @ 12.66 hrs Surf.Area= 5,376 sf Storage= 12,803 cf

Plug-Flow detention time= 112.1 min calculated for 0.667 af (93% of inflow)
Center-of-Mass det. time= 76.9 min (889.9 - 813.0)

Volume	Invert	Avail.Storage	Storage Description
#1	431.00'	34,416 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
438.20	10,500	1,921	34,416

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	431.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.30 cfs @ 12.66 hrs HW=435.19' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=1.48 cfs @ 12.66 hrs HW=435.19' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.48 cfs @ 7.52 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 3.24" for 25 YEAR event
Inflow = 47.12 cfs @ 12.31 hrs, Volume= 5.264 af
Outflow = 41.00 cfs @ 12.45 hrs, Volume= 5.249 af, Atten= 13%, Lag= 8.2 min
Primary = 41.00 cfs @ 12.45 hrs, Volume= 5.249 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 483.49' @ 12.45 hrs Surf.Area= 10,714 sf Storage= 30,771 cf

Plug-Flow detention time= 18.4 min calculated for 5.238 af (100% of inflow)
Center-of-Mass det. time= 16.7 min (857.6 - 840.9)

Volume	Invert	Avail.Storage	Storage Description
#1	479.00'	54,040 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
479.00	0	0	0
480.00	5,400	2,700	2,700
482.00	8,400	13,800	16,500
484.00	11,500	19,900	36,400
485.40	13,700	17,640	54,040

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	483.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'	**15.0" Vert. Orifice/Grate X 3.00** C= 0.600

Primary OutFlow Max=40.97 cfs @ 12.45 hrs HW=483.49' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 7.56 cfs @ 9.62 fps)
- **2=Broad-Crested Rectangular Weir** (Weir Controls 9.19 cfs @ 1.87 fps)
- **3=Orifice/Grate** (Orifice Controls 24.23 cfs @ 6.58 fps)

50 YEAR STORM

Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff = 223.94 cfs @ 12.37 hrs, Volume= 26.327 af, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

Area (sf)	CN	Description
252,232	30	Woods, Good, HSG A
130,414	55	Woods, Good, HSG B
3,464,785	70	Woods, Good, HSG C
3,847,431	67	Weighted Average
3,847,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.3	2,115	0.0310	5.58	111.63	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
25.8	3,242	Total			

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff = 11.96 cfs @ 12.19 hrs, Volume= 1.093 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
124,226	70	Woods, Good, HSG C
164,112	66	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff = 16.92 cfs @ 12.20 hrs, Volume= 1.629 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

	Area (sf)	CN	Description
*	1,260	98	Impervious A soils
*	1,260	98	Impervious B soils
*	12,600	98	Impervious C soils
	108,430	30	Woods, Good, HSG A
	5,012	55	Woods, Good, HSG B
	70,431	70	Woods, Good, HSG C
	57,257	39	>75% Grass cover, Good, HSG A
	6,593	61	>75% Grass cover, Good, HSG B
	99,683	74	>75% Grass cover, Good, HSG C
	362,526	55	Weighted Average
	347,406		95.83% Pervious Area
	15,120		4.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.9	992	0.0800	4.24		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
13.4	1,042	Total			

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff = 11.72 cfs @ 12.19 hrs, Volume= 1.070 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
111,978	70	Woods, Good, HSG C
8,865	74	>75% Grass cover, Good, HSG C
160,729	66	Weighted Average
160,729		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

Runoff = 137.86 cfs @ 12.34 hrs, Volume= 15.754 af, Depth> 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

Area (sf)	CN	Description
25,208	98	Paved parking & roofs
15,609	30	Woods, Good, HSG A
57,023	55	Woods, Good, HSG B
1,826,893	70	Woods, Good, HSG C
1,620	39	>75% Grass cover, Good, HSG A
7,767	61	>75% Grass cover, Good, HSG B
177,108	74	>75% Grass cover, Good, HSG C
2,111,228	70	Weighted Average
2,086,020		98.81% Pervious Area
25,208		1.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.8	1,638	0.0320	5.67	113.41	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
24.3	2,765	Total			

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

Runoff = 27.31 cfs @ 12.34 hrs, Volume= 3.162 af, Depth> 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

Area (sf)	CN	Description
66,896	98	Paved parking & roofs
66,352	70	Woods, Good, HSG C
212,436	74	>75% Grass cover, Good, HSG C
345,684	78	Weighted Average
278,788		80.65% Pervious Area
66,896		19.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.1	1,313	0.0970	1.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	1,363	Total			

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

Runoff = 9.20 cfs @ 12.16 hrs, Volume= 0.815 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

	Area (sf)	CN	Description
*	10,247	98	Impervious B soils
*	24,274	98	Impervious C soils
	6,013	70	Woods, Good, HSG C
	6,329	61	>75% Grass cover, Good, HSG B
	32,602	74	>75% Grass cover, Good, HSG C
	79,465	83	Weighted Average
	44,944		56.56% Pervious Area
	34,521		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0100	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
1.0	122	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	172	Total			

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

Runoff = 35.10 cfs @ 12.29 hrs, Volume= 3.763 af, Depth> 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

Area (sf)	CN	Description
2,512	98	Paved parking & roofs
19,818	74	>75% Grass cover, Good, HSG C
481,569	70	Woods, Good, HSG C
503,899	70	Weighted Average
501,387		99.50% Pervious Area
2,512		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.1	1,085	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.8	1,135	Total			

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

Runoff = 42.05 cfs @ 12.17 hrs, Volume= 3.721 af, Depth> 4.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

	Area (sf)	CN	Description
*	14,440	98	Impervious in A soils
*	2,086	98	Impervious in B soils
*	107,932	98	Impervious in C soils
	19,587	70	Woods, Good, HSG C
	17,729	39	>75% Grass cover, Good, HSG A
	14,430	61	>75% Grass cover, Good, HSG B
	220,338	74	>75% Grass cover, Good, HSG C
	396,542	79	Weighted Average
	272,084		68.61% Pervious Area
	124,458		31.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
4.6	438	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	158	0.0440	4.26		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.4	646	Total			

Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

Runoff = 0.53 cfs @ 12.10 hrs, Volume= 0.064 af, Depth> 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

Area (sf)	CN	Description
36,895	39	>75% Grass cover, Good, HSG A
36,895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	43	0.1860	0.24		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	26	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
3.1	69	Total			

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

Runoff = 1.41 cfs @ 12.08 hrs, Volume= 0.100 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 YEAR Rainfall=7.36"

	Area (sf)	CN	Description
*	2,085	98	Impervious - wet bottom
	1,108	74	>75% Grass cover, Good, HSG C
	11,382	61	>75% Grass cover, Good, HSG B
	14,575	67	Weighted Average
	12,490		85.69% Pervious Area
	2,085		14.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0800	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	24	0.0330	2.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.9	74	Total			

Summary for Reach 20R: CULVERT UNDER DRIVE A

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 3.98" for 50 YEAR event
Inflow = 181.02 cfs @ 12.41 hrs, Volume= 23.252 af
Outflow = 180.93 cfs @ 12.41 hrs, Volume= 23.250 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.74 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.18 fps, Avg. Travel Time= 0.2 min

Peak Storage= 767 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.42'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished
Length= 54.0' Slope= 0.0093 '/'
Inlet Invert= 429.00', Outlet Invert= 428.50'

Summary for Reach 21R: (new Reach)

Inflow Area = 88.403 ac, 7.03% Impervious, Inflow Depth > 3.65" for 50 YEAR event
Inflow = 193.10 cfs @ 12.44 hrs, Volume= 26.914 af
Outflow = 193.10 cfs @ 12.44 hrs, Volume= 26.914 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 2.48" for 50 YEAR event
Inflow = 8.08 cfs @ 12.68 hrs, Volume= 2.054 af
Outflow = 8.07 cfs @ 12.69 hrs, Volume= 2.053 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.84 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.11 fps, Avg. Travel Time= 0.3 min

Peak Storage= 100 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 60.0' Slope= 0.0750 '/'
Inlet Invert= 420.50', Outlet Invert= 416.00'

‡

Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 3.98" for 50 YEAR event
Inflow = 180.93 cfs @ 12.41 hrs, Volume= 23.250 af
Outflow = 179.98 cfs @ 12.44 hrs, Volume= 23.232 af, Atten= 1%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.49 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.32 fps, Avg. Travel Time= 2.1 min

Peak Storage= 10,191 cf @ 12.43 hrs
Average Depth at Peak Storage= 2.00'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 423.0' Slope= 0.0284 '/'
Inlet Invert= 428.50', Outlet Invert= 416.50'

‡

Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 4.25" for 50 YEAR event
Inflow = 57.37 cfs @ 12.41 hrs, Volume= 6.906 af
Outflow = 55.72 cfs @ 12.52 hrs, Volume= 6.880 af, Atten= 3%, Lag= 7.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.85 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 2.29 fps, Avg. Travel Time= 9.5 min

Peak Storage= 12,525 cf @ 12.46 hrs
Average Depth at Peak Storage= 1.24'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 1,309.0' Slope= 0.0252 '/'
Inlet Invert= 462.00', Outlet Invert= 429.00'

‡

Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth > 3.44" for 50 YEAR event
Inflow = 1.67 cfs @ 12.69 hrs, Volume= 0.618 af
Outflow = 1.67 cfs @ 12.72 hrs, Volume= 0.618 af, Atten= 0%, Lag= 2.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.30 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 2.1 min

Peak Storage= 122 cf @ 12.70 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 95.0' Slope= 0.0132 '/'
Inlet Invert= 430.25', Outlet Invert= 429.00'

‡

Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 4.56" for 50 YEAR event
Inflow = 42.46 cfs @ 12.17 hrs, Volume= 3.785 af
Outflow = 9.25 cfs @ 12.68 hrs, Volume= 3.212 af, Atten= 78%, Lag= 30.5 min
Discarded = 1.17 cfs @ 12.68 hrs, Volume= 1.158 af
Primary = 8.08 cfs @ 12.68 hrs, Volume= 2.054 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 429.24' @ 12.68 hrs Surf.Area= 21,027 sf Storage= 80,286 cf

Plug-Flow detention time= 229.0 min calculated for 3.212 af (85% of inflow)
Center-of-Mass det. time= 165.0 min (979.9 - 814.9)

Volume	Invert	Avail.Storage	Storage Description
#1	423.00'	111,220 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.00	0	0	0
424.00	3,900	1,950	1,950
426.00	15,500	19,400	21,350
428.00	18,800	34,300	55,650
430.00	22,400	41,200	96,850
430.60	25,500	14,370	111,220

Device	Routing	Invert	Outlet Devices
#1	Discarded	423.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	426.00'	**8.0" Round Culvert** L= 53.0' Ke= 0.500 Inlet / Outlet Invert= 426.00' / 422.00' S= 0.0755 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Primary	429.00'	**18.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.17 cfs @ 12.68 hrs HW=429.24' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.17 cfs)

Primary OutFlow Max=8.03 cfs @ 12.68 hrs HW=429.24' (Free Discharge)
├**2=Culvert** (Inlet Controls 2.86 cfs @ 8.20 fps)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 5.17 cfs @ 1.22 fps)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Inflow Area =	2.159 ac, 38.93% Impervious, Inflow Depth > 5.09" for 50 YEAR event			
Inflow =	10.18 cfs @	12.15 hrs, Volume=	0.915 af	
Outflow =	2.01 cfs @	12.69 hrs, Volume=	0.862 af, Atten= 80%, Lag= 31.9 min	
Discarded =	0.34 cfs @	12.69 hrs, Volume=	0.243 af	
Primary =	1.67 cfs @	12.69 hrs, Volume=	0.618 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 435.87' @ 12.69 hrs Surf.Area= 6,132 sf Storage= 16,714 cf

Plug-Flow detention time= 116.4 min calculated for 0.860 af (94% of inflow)
Center-of-Mass det. time= 85.3 min (891.7 - 806.4)

Volume	Invert	Avail.Storage	Storage Description
#1	431.00'	34,416 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
438.20	10,500	1,921	34,416

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	431.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.34 cfs @ 12.69 hrs HW=435.87' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=1.67 cfs @ 12.69 hrs HW=435.87' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 1.67 cfs @ 8.51 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 4.26" for 50 YEAR event
Inflow = 62.10 cfs @ 12.31 hrs, Volume= 6.925 af
Outflow = 57.37 cfs @ 12.41 hrs, Volume= 6.906 af, Atten= 8%, Lag= 5.8 min
Primary = 57.37 cfs @ 12.41 hrs, Volume= 6.906 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 483.90' @ 12.41 hrs Surf.Area= 11,343 sf Storage= 35,242 cf

Plug-Flow detention time= 17.7 min calculated for 6.906 af (100% of inflow)
Center-of-Mass det. time= 16.0 min (849.2 - 833.2)

Volume	Invert	Avail.Storage	Storage Description
#1	479.00'	54,040 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
479.00	0	0	0
480.00	5,400	2,700	2,700
482.00	8,400	13,800	16,500
484.00	11,500	19,900	36,400
485.40	13,700	17,640	54,040

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	483.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'	**15.0" Vert. Orifice/Grate X 3.00** C= 0.600

Primary OutFlow Max=57.16 cfs @ 12.41 hrs HW=483.89' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 7.93 cfs @ 10.09 fps)
- **2=Broad-Crested Rectangular Weir** (Weir Controls 22.53 cfs @ 2.52 fps)
- **3=Orifice/Grate** (Orifice Controls 26.70 cfs @ 7.25 fps)

100 YEAR STORM

Summary for Subcatchment 1: PRE FLOW TO W'LY PIKE CULVERT

Runoff = 299.30 cfs @ 12.36 hrs, Volume= 35.041 af, Depth> 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

Area (sf)	CN	Description
252,232	30	Woods, Good, HSG A
130,414	55	Woods, Good, HSG B
3,464,785	70	Woods, Good, HSG C
3,847,431	67	Weighted Average
3,847,431		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.3	2,115	0.0310	5.58	111.63	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
25.8	3,242	Total			

Summary for Subcatchment 2S: PRE FLOW TO E'LY PIKE CULVERT

Runoff = 16.07 cfs @ 12.19 hrs, Volume= 1.460 af, Depth> 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
124,226	70	Woods, Good, HSG C
164,112	66	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 11S: POST TO W'LY PIKE CULVERT

Runoff = 24.72 cfs @ 12.20 hrs, Volume= 2.307 af, Depth> 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

	Area (sf)	CN	Description
*	1,260	98	Impervious A soils
*	1,260	98	Impervious B soils
*	12,600	98	Impervious C soils
	108,430	30	Woods, Good, HSG A
	5,012	55	Woods, Good, HSG B
	70,431	70	Woods, Good, HSG C
	57,257	39	>75% Grass cover, Good, HSG A
	6,593	61	>75% Grass cover, Good, HSG B
	99,683	74	>75% Grass cover, Good, HSG C
	362,526	55	Weighted Average
	347,406		95.83% Pervious Area
	15,120		4.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.9	992	0.0800	4.24		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
13.4	1,042	Total			

Summary for Subcatchment 12S: POST TO E'LY PIKE CULVERT

Runoff = 15.74 cfs @ 12.19 hrs, Volume= 1.430 af, Depth> 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

Area (sf)	CN	Description
39,886	55	Woods, Good, HSG B
111,978	70	Woods, Good, HSG C
8,865	74	>75% Grass cover, Good, HSG C
160,729	66	Weighted Average
160,729		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
5.9	527	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	207	0.0250	7.96	190.95	**Channel Flow,** Area= 24.0 sf Perim= 18.6' r= 1.29' n= 0.035 Earth, dense weeds
13.5	784	Total			

Summary for Subcatchment 15S: POST TO ENTRANCE OF STIDSEN ROAD CULVERT

Runoff = 181.31 cfs @ 12.34 hrs, Volume= 20.707 af, Depth> 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

Area (sf)	CN	Description
25,208	98	Paved parking & roofs
15,609	30	Woods, Good, HSG A
57,023	55	Woods, Good, HSG B
1,826,893	70	Woods, Good, HSG C
1,620	39	>75% Grass cover, Good, HSG A
7,767	61	>75% Grass cover, Good, HSG B
177,108	74	>75% Grass cover, Good, HSG C
2,111,228	70	Weighted Average
2,086,020		98.81% Pervious Area
25,208		1.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.0	1,077	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.8	1,638	0.0320	5.67	113.41	**Channel Flow,** Area= 20.0 sf Perim= 31.0' r= 0.65' n= 0.035 Earth, dense weeds
24.3	2,765	Total			

Summary for Subcatchment 16S: POST TO RANDOLPH CIRCLE DRAINAGE

Runoff = 34.62 cfs @ 12.34 hrs, Volume= 4.034 af, Depth> 6.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

Area (sf)	CN	Description
66,896	98	Paved parking & roofs
66,352	70	Woods, Good, HSG C
212,436	74	>75% Grass cover, Good, HSG C
345,684	78	Weighted Average
278,788		80.65% Pervious Area
66,896		19.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
14.1	1,313	0.0970	1.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	1,363	Total			

Summary for Subcatchment 20S: STREET DRAINAGE FROM STIDSEN ROAD & OLIVE CIRCLE

Runoff = 11.42 cfs @ 12.16 hrs, Volume= 1.022 af, Depth> 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

	Area (sf)	CN	Description
*	10,247	98	Impervious B soils
*	24,274	98	Impervious C soils
	6,013	70	Woods, Good, HSG C
	6,329	61	>75% Grass cover, Good, HSG B
	32,602	74	>75% Grass cover, Good, HSG C
	79,465	83	Weighted Average
	44,944		56.56% Pervious Area
	34,521		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0100	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
1.0	122	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	172	Total			

Summary for Subcatchment 23S: OVERLAND FLOW TO DET BASIN AT RANDOLPH CIRCLE

Runoff = 46.17 cfs @ 12.29 hrs, Volume= 4.946 af, Depth> 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

Area (sf)	CN	Description
2,512	98	Paved parking & roofs
19,818	74	>75% Grass cover, Good, HSG C
481,569	70	Woods, Good, HSG C
503,899	70	Weighted Average
501,387		99.50% Pervious Area
2,512		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
10.1	1,085	0.1290	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.8	1,135	Total			

Summary for Subcatchment 25S: STREET DRAINAGE TO RETENTION BASIN

Runoff = 53.04 cfs @ 12.17 hrs, Volume= 4.730 af, Depth> 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

	Area (sf)	CN	Description
*	14,440	98	Impervious in A soils
*	2,086	98	Impervious in B soils
*	107,932	98	Impervious in C soils
	19,587	70	Woods, Good, HSG C
	17,729	39	>75% Grass cover, Good, HSG A
	14,430	61	>75% Grass cover, Good, HSG B
	220,338	74	>75% Grass cover, Good, HSG C
	396,542	79	Weighted Average
	272,084		68.61% Pervious Area
	124,458		31.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
4.6	438	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	158	0.0440	4.26		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.4	646	Total			

Summary for Subcatchment 26S: OVERLAND FLOW INTO RET BASIN

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.20 cfs @ 12.07 hrs, Volume= 0.106 af, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

Area (sf)	CN	Description
36,895	39	>75% Grass cover, Good, HSG A
36,895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	43	0.1860	0.24		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	26	0.3300	8.62		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
3.1	69	Total			

Summary for Subcatchment 27S: OVERLAND DRAINAGE TO DET BASIN AT OLIVE CIRCLE

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.88 cfs @ 12.08 hrs, Volume= 0.133 af, Depth> 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=8.79"

	Area (sf)	CN	Description
*	2,085	98	Impervious - wet bottom
	1,108	74	>75% Grass cover, Good, HSG C
	11,382	61	>75% Grass cover, Good, HSG B
	14,575	67	Weighted Average
	12,490		85.69% Pervious Area
	2,085		14.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0800	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
0.1	24	0.0330	2.72		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
4.9	74	Total			

Summary for Reach 20R: CULVERT UNDER DRIVE A

[62] Hint: Exceeded Reach 24R OUTLET depth by 0.41' @ 12.20 hrs
[63] Warning: Exceeded Reach 25R INLET depth by 0.31' @ 12.40 hrs

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 5.21" for 100 YEAR event
Inflow = 244.27 cfs @ 12.39 hrs, Volume= 30.453 af
Outflow = 244.17 cfs @ 12.40 hrs, Volume= 30.450 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.10 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.52 fps, Avg. Travel Time= 0.2 min

Peak Storage= 936 cf @ 12.40 hrs
Average Depth at Peak Storage= 1.73'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 302.29 cfs

10.00' x 2.00' deep channel, n= 0.012 Concrete pipe, finished
Length= 54.0' Slope= 0.0093 '/'
Inlet Invert= 429.00', Outlet Invert= 428.50'

Summary for Reach 21R: (new Reach)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 88.403 ac, 7.03% Impervious, Inflow Depth > 4.85" for 100 YEAR event
Inflow = 282.20 cfs @ 12.42 hrs, Volume= 35.721 af
Outflow = 282.20 cfs @ 12.42 hrs, Volume= 35.721 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach 22R: FLOW PATH FROM RET BASIN TO MASS PIKE

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 3.60" for 100 YEAR event
Inflow = 24.43 cfs @ 12.45 hrs, Volume= 2.985 af
Outflow = 24.56 cfs @ 12.45 hrs, Volume= 2.985 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.50 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.35 fps, Avg. Travel Time= 0.3 min

Peak Storage= 227 cf @ 12.45 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 292.23 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 60.0' Slope= 0.0750 '/'
Inlet Invert= 420.50', Outlet Invert= 416.00'

‡

Summary for Reach 23R: FLOW PATH FROM CULVERT TO MASS PIKE

[91] Warning: Storage range exceeded by 0.29'
[55] Hint: Peak inflow is 136% of Manning's capacity
[63] Warning: Exceeded Reach 20R INLET depth by 0.13' @ 12.80 hrs

Inflow Area = 70.130 ac, 4.30% Impervious, Inflow Depth > 5.21" for 100 YEAR event
Inflow = 244.17 cfs @ 12.40 hrs, Volume= 30.450 af
Outflow = 242.87 cfs @ 12.42 hrs, Volume= 30.428 af, Atten= 1%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.01 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.51 fps, Avg. Travel Time= 2.0 min

Peak Storage= 12,877 cf @ 12.41 hrs
Average Depth at Peak Storage= 2.29'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 179.73 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 5.0 '/' Top Width= 22.00'
Length= 423.0' Slope= 0.0284 '/'
Inlet Invert= 428.50', Outlet Invert= 416.50'

‡

Summary for Reach 24R: FLOW PATH FROM WATER QUALITY SWALE TO CULVERT

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 5.51" for 100 YEAR event
Inflow = 76.02 cfs @ 12.38 hrs, Volume= 8.955 af
Outflow = 74.27 cfs @ 12.49 hrs, Volume= 8.925 af, Atten= 2%, Lag= 6.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.31 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 2.43 fps, Avg. Travel Time= 9.0 min

Peak Storage= 15,444 cf @ 12.43 hrs
Average Depth at Peak Storage= 1.43'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 152.36 cfs

4.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 1,309.0' Slope= 0.0252 '/'
Inlet Invert= 462.00', Outlet Invert= 429.00'

‡

Summary for Reach 25R: FLOW PATH FROM DET BASIN OUTLET TO CULVERT

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth > 4.57" for 100 YEAR event
Inflow = 1.86 cfs @ 12.72 hrs, Volume= 0.821 af
Outflow = 1.86 cfs @ 12.76 hrs, Volume= 0.821 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.34 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 1.9 min

Peak Storage= 131 cf @ 12.74 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 56.23 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 95.0' Slope= 0.0132 '/'
Inlet Invert= 430.25', Outlet Invert= 429.00'

‡

Summary for Pond 19P: INFILTRATION BASIN AT 7+00 STIDSEN ROAD

Inflow Area = 9.950 ac, 28.71% Impervious, Inflow Depth > 5.83" for 100 YEAR event
Inflow = 53.83 cfs @ 12.17 hrs, Volume= 4.837 af
Outflow = 25.63 cfs @ 12.45 hrs, Volume= 4.211 af, Atten= 52%, Lag= 16.8 min
Discarded = 1.21 cfs @ 12.45 hrs, Volume= 1.225 af
Primary = 24.43 cfs @ 12.45 hrs, Volume= 2.985 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 429.58' @ 12.45 hrs Surf.Area= 21,645 sf Storage= 87,612 cf

Plug-Flow detention time= 195.8 min calculated for 4.211 af (87% of inflow)
Center-of-Mass det. time= 138.1 min (946.5 - 808.4)

Volume	Invert	Avail.Storage	Storage Description
#1	423.00'	111,220 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
423.00	0	0	0
424.00	3,900	1,950	1,950
426.00	15,500	19,400	21,350
428.00	18,800	34,300	55,650
430.00	22,400	41,200	96,850
430.60	25,500	14,370	111,220

Device	Routing	Invert	Outlet Devices
#1	Discarded	423.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	426.00'	**8.0" Round Culvert** L= 53.0' Ke= 0.500 Inlet / Outlet Invert= 426.00' / 422.00' S= 0.0755 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Primary	429.00'	**18.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.21 cfs @ 12.45 hrs HW=429.58' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.21 cfs)

Primary OutFlow Max=24.39 cfs @ 12.45 hrs HW=429.58' (Free Discharge)
├**2=Culvert** (Inlet Controls 3.03 cfs @ 8.68 fps)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 21.36 cfs @ 2.05 fps)

Summary for Pond 21P: DET BASIN AT OLIVE CIRCLE

Inflow Area = 2.159 ac, 38.93% Impervious, Inflow Depth > 6.42" for 100 YEAR event
Inflow = 12.73 cfs @ 12.15 hrs, Volume= 1.155 af
Outflow = 2.25 cfs @ 12.72 hrs, Volume= 1.099 af, Atten= 82%, Lag= 34.3 min
Discarded = 0.39 cfs @ 12.72 hrs, Volume= 0.278 af
Primary = 1.86 cfs @ 12.72 hrs, Volume= 0.821 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 436.60' @ 12.72 hrs Surf.Area= 7,007 sf Storage= 21,505 cf

Plug-Flow detention time= 123.9 min calculated for 1.097 af (95% of inflow)
Center-of-Mass det. time= 96.9 min (897.0 - 800.1)

Volume	Invert	Avail.Storage	Storage Description
#1	431.00'	34,416 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
431.00	0	0	0
432.00	2,090	1,045	1,045
434.00	4,050	6,140	7,185
436.00	6,275	10,325	17,510
438.00	8,710	14,985	32,495
438.20	10,500	1,921	34,416

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	431.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.39 cfs @ 12.72 hrs HW=436.60' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=1.86 cfs @ 12.72 hrs HW=436.60' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 1.86 cfs @ 9.45 fps)

Summary for Pond 22P: DET BASIN OFF END OF RANDOLPH CIRCLE

Inflow Area = 19.504 ac, 8.17% Impervious, Inflow Depth > 5.52" for 100 YEAR event
Inflow = 80.37 cfs @ 12.31 hrs, Volume= 8.980 af
Outflow = 76.02 cfs @ 12.38 hrs, Volume= 8.955 af, Atten= 5%, Lag= 4.6 min
Primary = 76.02 cfs @ 12.38 hrs, Volume= 8.955 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 484.29' @ 12.38 hrs Surf.Area= 11,948 sf Storage= 39,742 cf

Plug-Flow detention time= 16.9 min calculated for 8.955 af (100% of inflow)
Center-of-Mass det. time= 15.2 min (841.2 - 826.0)

Volume	Invert	Avail.Storage	Storage Description
#1	479.00'	54,040 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
479.00	0	0	0
480.00	5,400	2,700	2,700
482.00	8,400	13,800	16,500
484.00	11,500	19,900	36,400
485.40	13,700	17,640	54,040

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	483.00'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	481.00'	**15.0" Vert. Orifice/Grate X 3.00** C= 0.600

Primary OutFlow Max=75.64 cfs @ 12.38 hrs HW=484.28' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 8.27 cfs @ 10.52 fps)
- **2=Broad-Crested Rectangular Weir** (Weir Controls 38.50 cfs @ 3.01 fps)
- **3=Orifice/Grate** (Orifice Controls 28.87 cfs @ 7.84 fps)